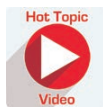


OPEN

# Surgical Indications and Outcomes of Mastectomy in Transmen: A Prospective Study of Technical and Self-Reported Measures

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**Background:** Although transgender surgery constitutes a growing field within plastic surgery, prospective studies on masculinizing mastectomies are lacking. The objectives of the present study were to prospectively follow a cohort of transmen undergoing mastectomy to assess technical and self-reported outcomes and to evaluate surgical decision-making.

**Methods:** Fifty-four transmen were recruited during a 10-month period at the Department of Plastic Surgery of the Centre of Expertise on Gender Dysphoria. Preoperative assessment included standardized chest examination. Six months postoperatively, participants rated their satisfaction with surgery, and 12-month postoperative surgical outcomes were reviewed independently. Surgical decision-making was evaluated by comparing indications and outcomes per technique, and assessing the clinical validity of the most-used decision aid (using the Cohen's kappa statistic).

**Results:** One periareolar mastectomy, 26 concentric circular mastectomies, and 22 inframammary skin resections with free nipple graft were performed in the authors' cohort. Five participants were still to be operated on. Concentric circular mastectomy was performed in smaller or medium-size breasts with low ptosis grade and good elasticity, whereas the inframammary skin resection group showed a wider range of physical characteristics. Despite being performed in better quality breasts, concentric circular mastectomy was associated with more secondary corrections (38.5 percent), dehiscence, seroma, and lower postoperative satisfaction compared with inframammary skin resections. Clinical decision-making was generally in line with the published decision aid.

**Conclusions:** Compared with inframammary skin resections, concentric circular mastectomy—despite being performed in favorable breast types—appears to produce poorer technical and self-reported outcomes. Surgical indications and preoperative counseling regarding secondary corrections may therefore be subject to improvement. (*Plast. Reconstr. Surg.* 140: 415e, 2017.)

**CLINICAL QUESTION/LEVEL OF EVIDENCE:** Therapeutic, IV.

**T**ransgender individuals constitute a group of people in which the sex assigned at birth does not correspond with their experienced

gender identity. As a result of their bodily dysphoria and/or difficulties living in the social gender role, a significant number of transgender individuals opt for gender-confirming medical interventions (often called sex reassigning interventions). The aim of transgender health care services is to

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improve long-term comfort through psychological, hormonal, and surgical interventions.<sup>1</sup>

For transmen (also called female-to-male transgender individuals), much of the bodily dysphoria and social difficulties with presenting as masculine relate to their feminine breasts.<sup>2</sup> To reduce breast contours, most transmen bind their chest (with special binders) before admission to clinical services. Studies assessing the treatment requests at clinical entry showed that despite the frequent hesitance toward genital surgery, all transmen planned to undergo (subcutaneous) mastectomy.<sup>3</sup> The pronounced degree of breast-related distress and the clinical effectiveness of the procedure have led to the coverage of mastectomy in many national or insurance programs.<sup>4</sup>

The objectives of mastectomy, or chest wall masculinization surgery, are to create a masculine chest region by aesthetic contouring of the chest wall by the removal of breast tissue and excessive skin, reduction and (re)positioning of the nipple-areola complex, and obliteration of the inframammary fold while minimizing chest wall scars.<sup>5</sup> Described surgical techniques are procedures without skin reduction (e.g., semicircular incision, liposuction), with periareolar skin resection [e.g., (extended) concentric circular technique], and inframammary skin resection techniques (e.g., with pedicled or free nipple graft).<sup>6</sup> Generally, breasts with a small cup size and good skin elasticity will be operated on through procedures without skin resection, small to medium-size breasts with limited ptosis and good elasticity can be operated through concentric circular techniques, and an inframammary skin resection is the preferred option for larger and/or ptotic breasts with poorer skin quality.<sup>6,7</sup> To assist in surgical decision-making, some authors have published algorithms for choosing the optimal mastectomy technique.<sup>7,8</sup>

The chances of complicated outcomes of surgery—whether it be functional issues or disappointment with the first results—are considered significant for this surgery; over the past decades, several retrospective cohort studies on the outcomes of mastectomy have been published.<sup>5–16</sup> Differing according to cohort and technique, the complication rates range from 6 to 33 percent,<sup>5,7–13,15,16</sup> and complications range from hematoma to (partial) nipple-areola necrosis. The reported rates of secondary corrections are up to 43 percent<sup>5–10,12,13,15,16</sup> and include scar revisions, chest contouring, and nipple-areola corrections. In some studies, operated transmen were surveyed on their satisfaction with chest appearance as well.<sup>7–10,12–14</sup> This satisfaction was generally high,

although information on sampling and assessment was usually limited.

In an earlier retrospective case series of mastectomies in transmen from 2012, we described a cohort from our clinic.<sup>6</sup> A main finding at that time, which has been reported by others afterward, was the high correction rate in the concentric circular group. However, because of persisting requests for this technique and the clinical impression of satisfactory outcomes, this technique is still performed frequently. Given the increase in clinical referrals in recent years, there is a need for prospective study of technical and self-reported outcomes of the different surgical techniques and other chest-masculinizing characteristics such as hair growth along with the evaluation of the choice of surgical technique. By relating preoperative characteristics, postoperative outcomes, and recommendations from the literature<sup>7</sup> to the performed surgical technique, we aim to improve the quality of surgical decision-making and preoperative information for mastectomy procedures.

## PATIENTS AND METHODS

### Study Procedure

The present study was conducted at the Department of Plastic, Reconstructive and Hand Surgery at the VU University Medical Center. Care is organized in the multidisciplinary Center of Expertise on Gender Dysphoria in accordance with the international Standards of Care.<sup>1</sup> The study was approved by the local ethical committee as a supplement to the ongoing cohort study of all applicants of medical interventions.<sup>17,18</sup> Standard practice included psychological screening and confirmation of the gender dysphoria diagnosis by a specialized psychologist, social transition to the experienced gender, and subscription of testosterone by a specialized endocrinologist.<sup>1,19</sup> As the last part of their medical trajectory, transmen may opt for gender-confirming operations, mostly (starting with) mastectomy. People qualified for mastectomy when aged 18 years or older and within the body mass index range of 18 to 35 kg/m<sup>2</sup>.

During a 10-month period (between September of 2014 and June of 2015), all transmen who applied for mastectomy were invited to participate in the present study. Written informed consent to be contacted after surgery was obtained from 33 individuals (61 percent). During 12 months postoperatively, data on preoperative characteristics and postoperative outcomes were collected on standardized case report forms (for all participants), and on satisfaction with the results

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through a paper survey (for those who consented) (Fig. 1). Nonresponders were reminded by means of mail and telephone.

### Surgical Procedure

Based on physical examination and the transman's preference, a surgical technique was selected during preoperative screening by any of the five surgeons. The performed surgical techniques included mastectomy without skin resection, concentric circular surgery (using absorbable sutures for subcutaneous tissue), and inframammary skin resection with a full-thickness free nipple graft. For a more extensive description on the surgical procedures, we refer to Cregten-Escobar et al.<sup>6</sup> The standard postoperative regimen in all techniques included wound drainage until 24-hour production was below 30 cc, 6 weeks of chest compression and no sports activity, and outpatient clinic visits 3 weeks and 3 months postoperatively (in the case of a free nipple graft, also 5 days postoperatively for bandage change).

### Measures

#### Sample Characteristics

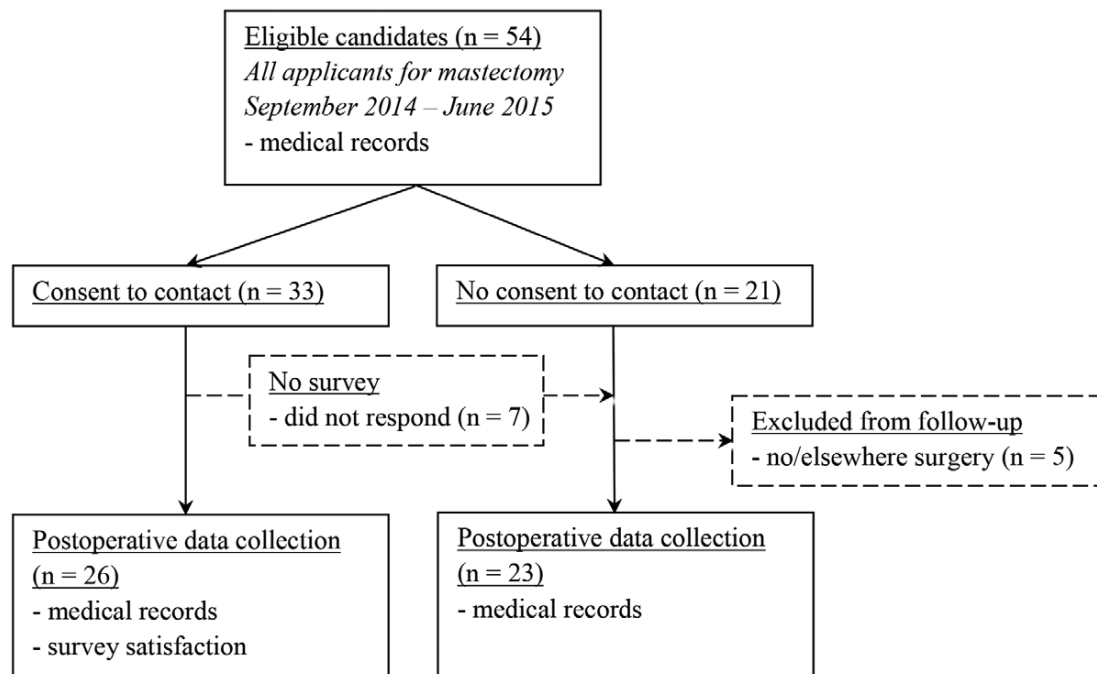
Before surgery, the following data were collected on case report forms: age, weight, height, relevant medical history (physical and mental), smoking habits, duration of hormone therapy

(also indicates social transition), and education level. Standardized chest examination included estimated breast size (cup), chest circumference, nipple-to-jugulum distances, ptosis grades, skin elasticity, and areola diameter.

#### Outcome Measures

During the 12 months after surgery, after all outpatient clinic visits were completed, data on surgical outcomes and secondary corrections was systematically collected by an independent researcher. The reported measures included performed surgical technique, resected breast volume, complications, and secondary corrections. Early complications were infection, hematoma, and repeated surgery; and outpatient complications included dehiscence, hematoma, seroma, tissue loss, vitality of the nipple-areola complex, asymmetry, skin irregularity, and skin surplus. Secondary corrections were assessed on a case-by-case basis.

A postoperative self-constructed questionnaire was sent at least 6 months after surgery, regardless of whether participants were planning additional secondary corrections. Participants were surveyed regarding the degree to which they had experienced a burdensome process, depression, anxiety, and complications on a Likert scale (0 = not at all to 4 = extremely). Participants were also asked whether they planned to undergo secondary corrections and/or other gender-confirming surgery



**Fig. 1.** Flow chart of study participants who consented to be contacted at follow-up but did not respond; data collection included review of medical records only.

(e.g., genital surgery). Chest hair was scored on a five-point visual scale, and participants ranked the experienced femininity (–3) or masculinity (3) of their chest. Lastly, participants’ satisfaction with their chest scars, sensitivity, nipples, shape, symmetry, and overall appearance was assessed using a 1 (very poor) to 10 (excellent) scale.

**Comparing Surgical Decision-Making with the Literature**

At follow-up, two independent researchers predicted the recommended mastectomy technique for each participant, applying the algorithm of Monstrey et al.<sup>7</sup> to preoperative (blinded) data on breast size, ptosis grade, and skin elasticity (Fig. 2). The two (expert) observers had to reach agreement on the recommended surgery for each participant, after which the concordance between the recommended and performed technique was evaluated. If these differed, operative considerations were reviewed manually. The prediction was performed independently from clinical

decision-making and was only executed to validate the decision-aid for study purposes.

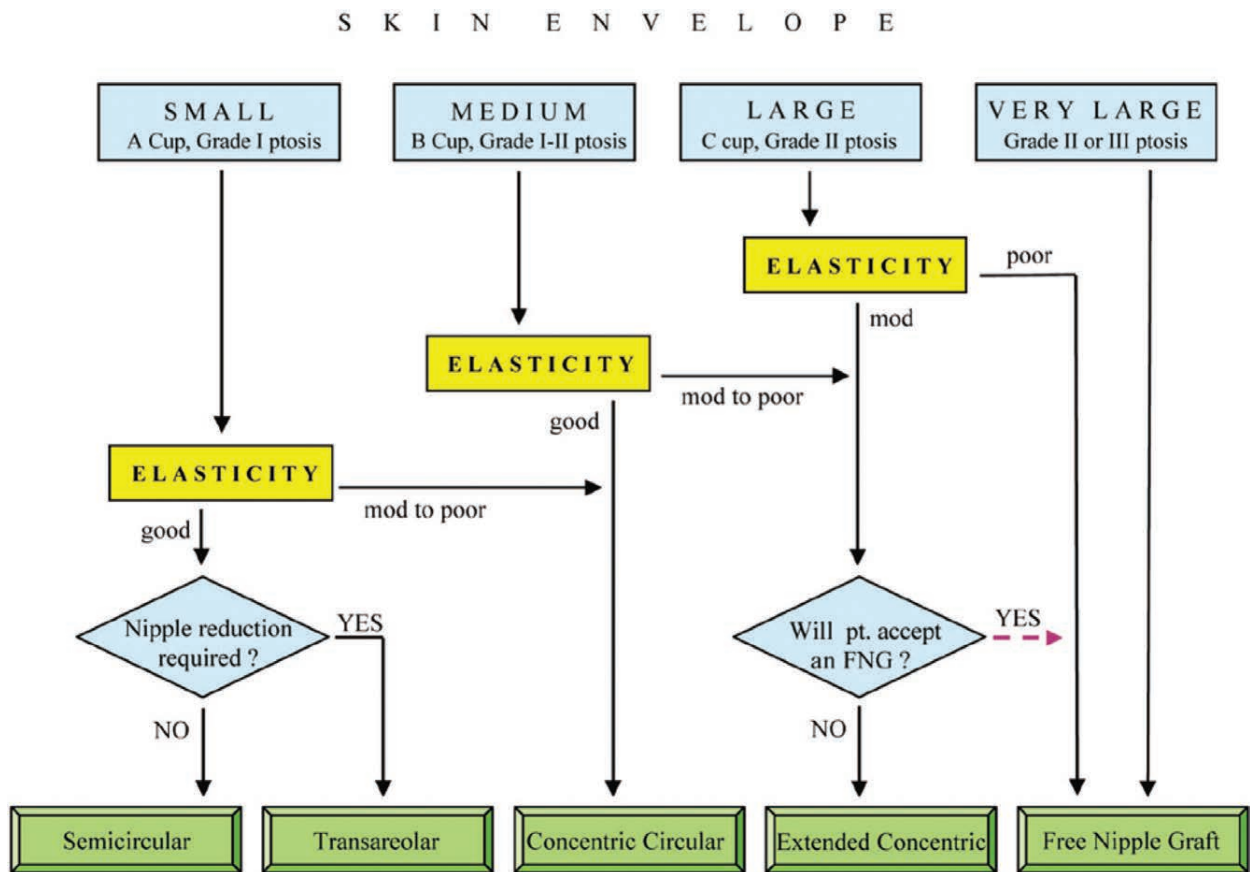
**Statistical Analysis**

The background data and physical examinations were analyzed as frequencies and means. Preoperative and postoperative measures were distributed normally. Group differences between concentric circular and inframammary skin resection techniques were tested by means of two-sided *t* tests and chi-square tests. Associations between the outcome measures were assessed using Pearson correlations. Statistical assessment of the algorithm was performed by calculating a Cohen's kappa statistic. All statistical analyses were performed in IBM SPSS Version 22.0 (IBM Corp., Armonk, N.Y.).

**RESULTS**

**Sample Characteristics**

The sample (*n* = 54) consisted of a relatively young and medium-level educated group of



**Fig. 2.** Algorithm for choosing the appropriate subcutaneous mastectomy technique. FNG, free nipple graft. (Retrieved with permission from Monstrey S, Selvaggi G, Ceulemans P, et al. Chest-wall contouring surgery in female-to-male transsexuals: A new algorithm. *Plast Reconstr Surg.* 2008;121:849–859.)



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participants (Table 1). Relevant physical diagnoses included inflammatory bowel diseases, pulmonary hypertension, and cerebrovascular accidents; whereas mental diagnoses included anxiety, depression, autism, alcohol abuse, and suicide attempts. All participants were on testosterone therapy, except one who identified as genderqueer (other than male or female) and requested just a mastectomy.

At study closure, five participants had not/elsewhere been operated on. Only one person had undergone mastectomy without skin resection and was excluded from the group comparisons. The group of participants who had undergone concentric circular mastectomy ( $n = 26$ ) had a significantly smaller chest circumference, nipple-to-jugulum distances, and areola diameter compared with the inframammary skin resection group ( $n = 22$ ). Also, breast size was lower, elasticity was better, and there was less ptosis in the concentric circular group. In the inframammary skin resection group, measures showed a wider range (Table 2) (all preoperative data). No significant differences in surgical techniques applied were observed between the individual surgeons.

**Table 1. Sample Characteristics\***

Characteristic	Value (%)
Total	54
Age, yr	
Mean	25.8
Range	18–59
Education	
Lower	16 (31.4)
Intermediate	27 (52.9)
Higher	8 (15.7)
Co-occurring physical diagnoses	
Yes	7 (13.0)
No	47 (87.0)
Co-occurring psychiatric diagnoses	
Yes	13 (24.1)
No	41 (75.9)
Smoking	
Yes	12 (25.0)
No	36 (75.0)
BMI, kg/m <sup>2</sup>	
Mean	24.8
Range	18–35
Hormone therapy, mo	
Mean	17.1
Range	0–48
Surgical techniques	
Without skin resection	1 (1.9)
Concentric circular	26 (48.1)
Inframammary skin resection and full-thickness graft	22 (40.7)
Surgery not performed/performed elsewhere	5 (9.3)

BMI, body mass index.

\*Because of missing data, numbers may sum differently.

### Technical Outcomes

The incidence rates of complications and secondary corrections are listed in Table 3. Neither early nor outpatient clinic complications differed statistically significant between the groups. However, concentric circular procedures came with a higher chance of dehiscence, seroma, asymmetry, and secondary corrections (38.5 percent; OR, 2.35) (Fig. 3). Inframammary skin resections with a free nipple graft showed a higher chance of (partial) nipple loss and skin irregularity or surplus (Fig. 4). Frequent objectives of secondary corrections were scar tissue correction and areola reduction.

### Self-Reported Outcomes

Twenty-six participants (79 percent) returned the survey with self-reported measures. In retrospect, nine encountered the process around the operations as moderately to extremely burdensome, and seven had experienced a high level of complications. Feelings of anxiety or depression were prevalent (41.7 and 79.2 percent, respectively) but mostly of a minor level. More than a little chest hair growth was reported by 12.5 percent only. However, the postoperative chest was experienced as masculine by the majority of respondents (73.6 percent). Participants who had undergone concentric circular mastectomy were less satisfied on most aspects of the chest in relation to the group who underwent inframammary skin resection (Table 4). Fourteen participants planned to undergo genital surgery and 12 considered secondary corrections; however, at 1-year follow-up, none of them had actually undergone a correction. Dissatisfied respondents more frequently intended to undergo secondary corrections, which suggests that satisfaction after corrections may further improve.

Most aspects of satisfaction were significantly associated (Table 5). The strongest correlation of overall satisfaction was found with chest shape and symmetry. No associations were found between overall cosmetic satisfaction and demographic characteristics or anxiety, depression, and experienced burden around surgery, although a trend on the latter was seen ( $r = -0.36$ ,  $p = 0.09$ ), implying that more experienced burden around the surgery may be associated with a less positive outcome.

### Surgical Decision-Making

Although not all techniques included in the Monstrey et al. decision aid were performed in

**Table 2. Physical Characteristics by Technique\***

	Concentric Circular (%)	ISR plus FTG (%)	Test Statistics
No.	26	22	
Estimated breast size			$\chi^2(6,40) = 36.1, p < 0.001$
A	2 (8.7)	0 (0)	
B	21 (91.3)	1 (5.9)	
C	0 (0)	4 (23.5)	
D	0 (0)	7 (41.2)	
E	0 (0)	2 (11.8)	
F	0 (0)	1 (5.9)	
G or larger	0 (0)	2 (11.8)	
Chest circumference, cm			$t(45) = -4.53, p < 0.001$
Mean	79.2	88.1	
SD	6.1	7.4	
Nipple–jugulum distance, cm			
Left			$t(45) = -5.33, p < 0.001$
Mean	18.9	25.5	
SD	1.9	5.9	
Right			$t(45) = -5.48, p < 0.001$
Mean	18.5	25.2	
SD	2.0	5.8	
Areola diameter, cm			$t(37) = -4.22, p < 0.001$
Mean	3.6	5.2	
SD	1.0	1.3	
Breast elasticity			$\chi^2(2,44) = 18.0, p < 0.001$
Good	21 (87.5)	5 (25.0)	
Intermediate	3 (12.5)	12 (60.0)	
Poor	0 (0)	3 (15.0)	
Ptois grade			$\chi^2(2,46) = 29.5, p < 0.001$
1	23 (92.0)	3 (14.3)	
2	2 (8.0)	5 (23.8)	
3	0 (0)	13 (61.9)	

FTG, full-thickness graft; ISR, inframammary skin resection.

\*Because of missing data, numbers may sum differently.

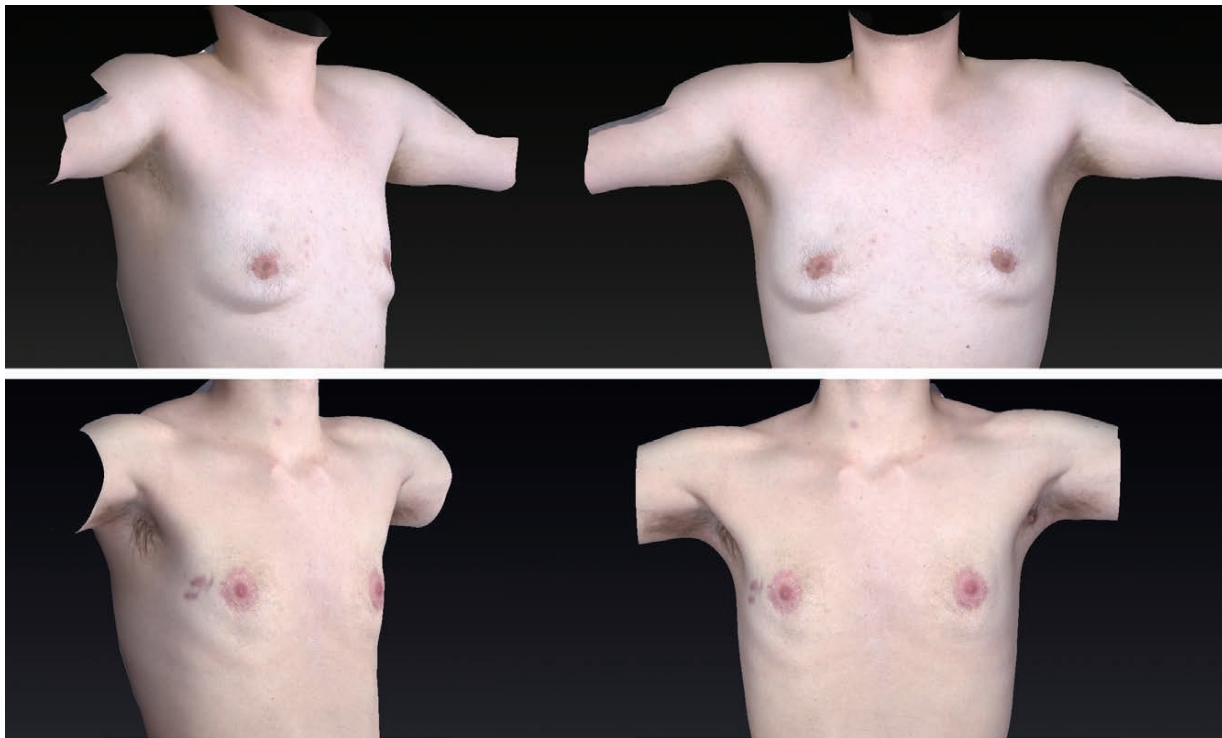
**Table 3. Outcomes by Technique: Complications and Secondary Corrections\***

	Concentric Circular (%)	ISR plus FTG (%)	Test Statistics
No.	26	22	
Resected tissue volume, g†			
Mean	165	629	
Range	24–575	105–2438	$t(88) = -6.84, p < 0.001$
Early complications			
Infection†	2 (3.8)	0 (0)	$p > 0.05$
Hematoma†	3 (5.8)	4 (9.1)	$p > 0.05$
Reoperation†	3 (5.8)	2 (4.5)	$p > 0.05$
Outpatient clinic complications			
Dehiscence†	6 (11.5)	1 (2.3)	$p > 0.05$
Hematoma†	5 (9.6)	4 (9.1)	$p > 0.05$
Seroma†	9 (17.3)	3 (6.8)	$p > 0.05$
Total volume, ml			
Mean	59.3	NR	
Range	10–150		
Partial/full tissue loss†	4 (7.7)	1 (2.3)	$p > 0.05$
Partial/full nipple nonvital†	3 (5.8)	6 (13.6)	$p > 0.05$
Asymmetry‡	8 (30.8)	4 (18.2)	$p > 0.05$
Skin irregularity‡	5 (20.8)	6 (30.0)	$p > 0.05$
Skin surplus‡	5 (19.2)	7 (31.8)	$p > 0.05$
Secondary corrections‡	10 (38.5)	3 (13.6)	$\chi^2(1,47) = 3.72, p = 0.05$

FTG, full-thickness graft; ISR, inframammary skin resection; NR, not reported.

\*Because of missing data, numbers may sum differently.

†Calculated per breast ( $n = 96$ ).‡Calculated per participant ( $n = 48$ ).



**Fig. 3.** (Above) Postoperative result of concentric circular mastectomy. The participant requested secondary correction because of remnant breast tissue. (Below) Postoperative result of concentric circular mastectomy. The participant requested secondary correction because of large areola size.



**Fig. 4.** Postoperative result of inframammary skin resection with free nipple graft. The participant requested secondary correction because of excessive scarring.

the current study sample, the algorithm showed good predictive value (Table 6) ( $\kappa = 0.76$ ,  $p < 0.001$ ). In six cases, the performed technique differed from the one suggested by the decision aid. Reasons for this difference included preference of the transman, improved surgical access, and the need for areola reduction (in concentric circular compared to a resection without skin). Differing cases did not report lower satisfaction with surgery compared with the ones who did not differ.

## DISCUSSION

Acquiring a masculine chest is an important attribute of a transman's medical transition. Despite the growing number of procedures performed, all outcome studies on subcutaneous mastectomy at present concern retrospective series. The present study is the first study to report on prospectively and systematically collected data, including both technical and self-reported outcomes, and to evaluate surgical decision-making.

**Table 4. Median Chest Evaluation by Technique\***

	Concentric Circular	ISR plus FTG
No.	14	12
Satisfaction		
Scarring†	7.5 (2–10)	6.0 (5–9)
Sensibility†	6.0 (1–10)	7.0 (5–10)
Nipple†	6.0 (1–10)	6.0 (3–10)
Chest shape†	6.3 (2–10)	7.8 (4–10)
Symmetry†	7.0 (1–10)	8.0 (4–10)
Overall†	7.0 (3–10)	7.0 (3–10)
Masculinity‡	2.0 (–2–3)	2.0 (–1–3)
Chest hair§	1.0 (0–4)	2.0 (0–4)

FTG, full-thickness graft; ISR, inframammary skin resection.

\*Mean (range) reported.

†1 to 10 scale.

‡–3 to +3 scale.

§0 to 4 scale.

The majority of the present sample had been operated on through concentric circular mastectomy. Surgery by means of this approach is preferably performed when the volume of resected tissue is limited, the nipple is located in a (close to) masculine position, and the skin is sufficiently elastic. With the rise of early clinical admission and puberty blocking, the incidence of transmen with this breast type is expected to increase. Concentric circular mastectomy is a surgical technique with a steep learning curve, as considerable experience is required in assessing the adequacy of skin elasticity, in securing adequate tissue removal through a smaller surgical window, but mostly in regulating periareolar traction. As too much traction (because of overreaction of the skin) may lead to dehiscence, scarring, and asymmetrical areola shape, too little traction increases the chances of periareolar skin surplus and the impression remnants of a feminine breast. In contrast, mastectomy through inframammary skin resection and free nipple graft allows good results in a variety of cases in which a concentric circular technique is not possible, including in larger/ptotic breasts or with poorer skin elasticity. The latter is frequently the case after long-term breast binding and/or massive weight loss.

The physical profiles per technique found in this study correspond with earlier published recommendations<sup>7,8</sup> and clinical studies.<sup>6–8,16</sup> Our findings underline the reasoning by Monstrey et al. emphasizing decision-making based on breast size, ptosis, and skin elasticity.<sup>7</sup> Accordingly, the predictive value of their most-used decision aid was found to be high in the present sample. In the six cases where surgery had been performed different from the recommended technique, the technique performed was more extensive. Explanations for these “deviations” included the following: (1) in small breasts with a large areola, mastectomy without periareolar skin resection would leave the nipple-areola complex feminine; (2) for larger breasts with moderate skin elasticity, inframammary skin resection was preferred over an extended concentric circular approach, as the latter produces poorer outcomes in our experience; (3) there were cases in which the nipple-areola complex could not be positioned in a masculine position when left pedicled in a concentric circular technique; (4) some transmen preferred one surgical technique over another (e.g., inframammary skin over a concentric circular resection); and (5) skin elasticity was no objective measure, possibly resulting in different interpretations among surgeons. Regardless of these modifications, we found the decision aid highly applicable to clinical decision-making in our population.

For obvious reasons, surgical decision-making is based not on physical examination alone but also on technical and self-reported outcomes. The present study was initiated to prospectively assess that which up to this point had been assessed only retrospectively. We found that the risk of early complications was lower than 10 percent per breast for both techniques, which was similar<sup>6,7,9,10,13,15</sup> or lower<sup>5,12,16</sup> than earlier reported rates. Concentric circular procedures showed a higher chance of periareolar dehiscence, seroma, and asymmetry of the final result, whereas inframammary skin

**Table 5. Associations of Overall Cosmetic Satisfaction\***

	Scarring	Sensibility	Nipple	Chest Shape	Symmetry	Overall
Scarring	—					
Sensibility	0.01	—				
Nipple	0.04	0.58†	—			
Chest shape	0.02	0.70§	0.56†	—		
Symmetry	0.06	0.74§	0.33	0.66†	—	
Overall	0.04	0.56†	0.44†	0.78§	0.64†	—

\*r values displayed:

† $p < 0.05$ ;‡ $p < 0.01$ ; and§ $p < 0.001$ .



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**Table 6. Concordance between Suggested and Performed Technique**

Performed Technique	Technique Decision Aid		
	Without Skin	Concentric Circular	ISR plus FTG
Without skin	1	0	0
Concentric circular	3	20	0
ISR plus FTG	0	3	18

FTG, full-thickness graft; ISR, inframammary skin resection.

resections showed a higher chance of (partial) nipple loss and skin surplus. Our study confirmed earlier findings of a higher frequency of periareolar dehiscence and seroma in concentric circular mastectomy,<sup>16</sup> and the increased rate of (partial) nipple loss in inframammary skin resection mastectomy,<sup>7</sup> whereas others reported different outcomes.<sup>8</sup> Although the pathogenesis of seroma is still poorly understood, hypothesized factors include surgical technique (smaller window in concentric circular) and obliteration of the dead space (less skin tissue resected in concentric circular).<sup>20</sup> The increased rate of dehiscence will most likely result from (asymmetrical) periareolar traction. The higher level of (partial) nipple loss in the inframammary skin resection mastectomy is thought to be caused by the use of a free nipple graft over a pedicled nipple in the concentric circular mastectomy. To see the surgical learning curve in our own clinic, the present secondary correction rates were compared with earlier data.<sup>6</sup> Although correction rates for both techniques have decreased, the risk of secondary correction remained more than twice as high for concentric circular (from 54.7 percent to 38.5 percent) compared with inframammary skin resections (from 23.3 percent to 13.6 percent). Comparable percentages have been reported throughout the literature.<sup>5-10,12,13,15,16</sup>

Remarkably, the breasts with the most favorable physical characteristics preoperatively show the most complicated postoperative course. Our motivation to keep performing concentric circular mastectomy after our earlier findings included the impression that people were still satisfied with the results. The current study shows that participants were moderately satisfied to satisfied with the overall cosmetic outcome and generally experienced their chest to be masculine. This was despite the limited chest hair growth, which frequently cannot cover postoperative scarring or cosmetic imperfections, making the chest appearance more masculine. Our present data also show that participants with inframammary skin resections were more satisfied on almost all indicators

compared with the concentric circular group. This may be the result of greater relief after removing larger breasts but also of the lower rate of secondary corrections and possibly more realistic expectations. The satisfaction rates were slightly lower than earlier reported satisfaction scores, which may be associated with the higher percentage of people who did not receive secondary corrections yet and the sample representativeness of our prospective design (dissatisfied participants may have been less likely to be lost to follow-up).

The present study was limited by the relatively short follow-up period, resulting in uncertain final satisfaction and secondary correction rates. Also, no objective preoperative measure of breast size was used, and no external measure, such as photography or the surgeon's evaluation, of the cosmetic outcomes was obtained to relate to the self-reported measures. Lastly, no validated instruments on self-reported outcomes were available for this population.

## CONCLUSIONS

Surgical decision-making for mastectomy based on breast size, ptosis, and skin elasticity provides a good framework. Although the concentric circular approach can be a technique with limited postoperative scarring, it is generally limited to a distinct breast type. Despite being performed in a group with favorable preoperative breast quality, concentric circular mastectomy showed a higher rate of secondary corrections, and lower cosmetic satisfaction compared with the inframammary skin resection group. Recognizing our own learning curve, correction rates may decrease over time, but concentric circular mastectomy remained associated with an increased chance of secondary corrections.

To improve the clinical outcomes for the group of applicants who select for a concentric circular mastectomy, surgeons may want to further optimize the technique (e.g., modifying the periareolar incision to optimize periareolar traction) or more frequently choose to perform an inframammary skin resection in case of doubt. In addition, preoperative counseling for concentric circular mastectomy candidates should moderate individual expectations. This means that choosing for this technique includes an increased risk that the first result may not be fully satisfactory and that secondary corrections are required in almost two of five transmen. To improve our ability to "predict" who is at risk for these corrections, we encourage more prospective studies in this field.

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